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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/887,777	06/22/2001	R. Bruce Doak	9138-0060	8709

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EXAMINER	
HASSANZADEH, PARVIZ	

ART UNIT	PAPER NUMBER
1763	

DATE MAILED: 09/25/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/887,777	DOAK ET AL.	
	Examiner	Art Unit	
	Parviz Hassanzadeh	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 August 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) *1-11 and 19-35* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *12-18 and 36-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 February 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☒ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 7 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of Group II, apparatus claims 12-18 and 36-38, in Paper No. 6 is acknowledged.

Claims 1-11 and 19-35 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Group I (method claims), there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 6.

Oath/Declaration

It does not include the notary's signature of one of the inventors, Christopher T. Burns.

Specification

The disclosure is objected to because of the following informalities:

on page 6, line 17, it is suggested to delete "7" before "series";

on page 7, line 2, it is suggested to delete "IV" before "characteristics".

Appropriate correction is required.

Drawings

The drawings are objected to because in Fig. 1, reference sign 22 assigned to the tube is pointing to the circulator electrode 38 (see page 6, lines 6-16 and Fig. 2). A proposed drawing

correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 12 ~~1~~ is rejected under 35 U.S.C. 102(b) as being anticipated by Cappelli et al (Material Letters Vol. 31, 1997, pages 161-164).

Cappelli et al teach an apparatus (Fig. 1) for producing GaN (Gallium Nitride) film on a substrate, the apparatus comprising:

a pair of anode (-) and cathode (+) electrodes (*corona-discharge producing electrodes*) for generating direct current arc plasma;

a nitrogen gas source for introducing nitrogen as an arc source gas into a apace between the electrodes (*a nitrogen delivery path leading to a location at which the electrodes produce a corona discharge*); and

a substrate mount supporting a substrate (*means to locate a substrate for deposition thereon of nitrogen activates by the corona discharge*).

The apparatus further includes an evaporative Ga-source for providing Ga vapor to the plasma to form GaN film on the substrate. (the entire of page 162).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 12, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hinchliffe (US Patent No. 5,821,548) in view of Cappelli et al (Material Letters Vol. 31, 1997, pages 161-164).

Hinchliffe teach an apparatus (Fig. 1) for depositing thin-film on a substrate, the apparatus comprising:

a corona electrode 40 disposed inside a nozzle tube 22 and positively biases skimmer 16 (*corona-discharge producing electrodes*) for generating corona discharge plasma35;

a gas source 28 for introducing a gas such as nitrogen as an arc source gas into the nozzle tube 24 (*a nitrogen delivery path leading to a location at which the electrodes produce a corona discharge*); and

a substrate mount (not shown) supporting a substrate 22 (*means to locate a substrate for deposition thereon of nitrogen activates by the corona discharge*) (column 5, line 45 through column 6, line 33; column 7, lines 10-18; column 8, line 60 through column 9, line 10; column 9, lines 54-67).

Hinchliffe fails to teach a material source for form a nitride film thereof.

Cappelli et al teach an apparatus (Fig. 1) for producing GaN (Gallium Nitride) film on a substrate, the apparatus comprising : a pair of anode (-) and cathode (+) electrodes for generating direct current arc plasma; a nitrogen gas source for introducing nitrogen as an arc source gas into a apace between the electrodes; a substrate mount supporting a substrate; and an evaporative Ga-source for providing Ga vapor to the plasma to form GaN film on the substrate. (the entire of page 162).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to employ the Ga-evaporator source as taught by Cappelli et al in the apparatus of Hinchliffe in order to produced a nitride film the substrate.

Regarding claim 13: the apparatus of Hinchliffe includes a discharge nozzle 12 with a nitrogen emersion orifice in the nitrogen passageway 33 (*delivery path*), the corona electrode 40being proximate the nitrogen emersion orifice of the nozzle 12 (Fig. 2), the skimmer electrode 16 (a second of the corona discharge electrodes) being spaced from the nitrogen emersion orifice of the nozzle and the first one of the corona discharge electrode, the skimmer 16 being located downstream of the nozzle 12 in the direction of nitrogen flow, the skimmer 16 defining an opening to collimate a beam of the activated nitrogen molecules passing therethrough, at least one chamber 23 downstream of the skimmer 16, a pump 80 (means for evacuating) for

evacuating the chamber 23 for form *supersonic expansion* and to draw off gases other than activated nitrogen molecules prior to the activated nitrogen molecules reaching the substrate (also see column 9, lines 11-19).

Claims 14, 15, 17, 18 and 36-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hinchliffe (US Patent No. 5,821,548) in view of Cappelli et al (Material Letters Vol. 31, 1997, pages 161-164) as applied to claims 12, 13 above, and further in view of Yamauchi et al (US Patent No. 6,207,951 B1).

Hinchliffe in view of Cappelli et al teach all limitations of the claims as discussed above except for the supersonic expansion chamber (*the at least one chamber*) including a plurality of succeeding chambers with means for evacuation (claim 14); or means for collimating the jet of nitrogen molecules (claim 36 and its dependent claims 37, 38).

Yamauchi et al teach a corona discharge apparatus (Fig. 1) for depositing material on the surface of a substrate. The apparatus includes a buffer chamber 9 and a high vacuum chamber 13 arranged between a skimmer 8 and a substrate 14, wherein the chambers 9 and 13 are pumped differentially by achieve ultra high vacuum in the chamber 13 where the substrate is located (column 5, lines 13-41). The two chambers are separated by a ultrahigh vacuum wall 15 having a hole 15a (means for collimating) through which plasma gas passes and impinges upon the substrate 14.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the ultra high vacuum wall and the hole as taught by Yamauchi et al in the apparatus of Hinchliffe in view of Cappelli et al in order to differentially achieve ultra high vacuum in the chamber where the substrate is disposed. Further It is held *in re Harza, 274 F.2d*

669, 124 USPQ 378 (CCPA 1960) that a mere duplication of parts has no patentable significance unless a new and unexpected result is produced therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add more differentially pumped chambers and perforated walls therebetween in order to achieve higher level of vacuum.

Regarding claims 15, 17, 18: as shown in Fig. 2 of the apparatus of Hinchliffe, the discharge nozzle 12 form a nozzle orifice 20 at its end, the tube 24 being in the nitrogen passageway 33 (*delivery path*), the first one the corona-discharge electrode 40 being located within the tube 24, the second one of the corona-discharge electrode (skimmer 16) being located outside the tube 24, the nitrogen emergent from the tube 24 into a corona discharge 35 between the electrodes forming with the corona discharge 35 a corona discharge supersonic free-jet (column 5, line 45 through column 6, line 33; column 7, lines 10-18; column 8, line 60 through column 9, line 10; column 9, lines 54-67).

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hinchliffe (US Patent No. 5,821,548) in view of Cappelli et al (Material Letters Vol. 31, 1997, pages 161-164) and Yamauchi et al (US Patent No. 6,207,951 B1) as applied to claims 14, 15, 17, 18 and 36-38 above, and further in view of Bachir et al (Chemical Physics Letters Vol. 270, 1997, pages 533-537).

Hinchliffe in view of Cappelli et al and Yamauchi et al teach all limitations of the claims as discussed above except for the second of the corona-discharge electrodes being generally annular and surround the restricted end of the tube.

Bachir et al teach a corona discharge source (Fig. 1) wherein a hollow cylindrical cathode is used as the second of the corona electrode such that due to the large surface thereof sparking

of the discharge to the grounded metallic part of the expansion chamber is prevented. Fur the purpose of the spectroscopic study of the corona discharge, the hollow cylinder cathode is located approximately 30 mm down below the orifice of the jet.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the corona-discharge cathode electrode as taught by Bachir et al in the apparatus of Hinchliffe in view of Cappelli et al and Yamauchi et al in order to prevent sparking of the discharge to the chamber walls. Further since the intended use of the apparatus of Hinchliffe in view of Cappelli et al and Yamauchi et al is not spectroscopic study the plasma, the hollow cylinder cathode may be arranged around the tube 24 rather than down stream where the skimmer 16 is located.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kurihara et al (US Patent No. 5,403,399) teach an arc plasma source formed of concentric anode and cathode electrodes for chemical vapor deposition;

Spruck (US Patent No. 3,283,120) teach an electron beam comprising a cathode 1 surrounded by a control cylinder 2;

Parker et al (US Patent No. 5,165,954) teach a system for producing a precisely focused ion beam employing a plurality of ion lenses.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Parviz Hassanzadeh whose telephone number is (703)308-2050. The examiner can normally be reached on Tuesday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on (703)308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9310 for regular communications and (703)872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0661.

P. Hassanzadeh

Parviz Hassanzadeh
Examiner
Art Unit 1763

September 14, 2002